IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re. Application of :

Immanuel Straub

Application No.: 10/591,100

Filed: October 25, 2006

For: Catheter For Aspirating, Fragmenting And Removing Material

Confirmation No.: 6349

Examiner : David C. Eastwood

Technology Center/ Art Unit: 3731

APPELLANT'S BRIEF UNDER 37 CFR §41.37

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Honorable Sir:

Further to the Notice of Appeal filed July 1, 2010 for the above-referenced patent application, Appellant submits this Brief on Appeal. This submission is accompanied by a payment in the amount of $270 for the appeal fee required under 37 CFR 41.20(b)(2).

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1. REAL PARTY IN INTEREST

The real party in interest is Straub Medical AG, having corporate address at Straubstrasse, Wangs Switzerland, Postal Code: CH-7323. An assignment document of all rights, title, and interest in the present application to Straub Medical AG was executed by the inventor and is recorded in the U.S. Patent and Trademark Office at reel 018467, frame 0051.

2. RELATED APPEALS AND INTERFERENCES

There are no other related appeals or interferences.

3. STATUS OF CLAIMS

The application, as filed, included claims 1-25.

In an Amendment dated March 4, 2009, claims 22 and 25 were canceled.

In an Amendment dated January 15, 2010, claims 1-21, 23 and 24 were canceled in favor of new claims 26-49.

Claims 26-49 are finally rejected and are being appealed.

4. STATUS OF AMENDMENTS

A Final Office Action was mailed March 1, 2010. No amendments have been submitted after mailing of the Final Office Action.

5. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 26 is directed to a catheter enabling aspirating, fragmenting, and removing of emboli and thrombi associated with occlusive diseases of the blood vessels. As depicted in Fig. 1, a flexible tube 12 has a distal end connected to a working head 11. Depicted in greater detail in Figs. 2-3, 6, and 9-10, this working head 11 has its proximal end connected to tube 12 (specification, p.15, parag.[0070]). The working head 11a, as depicted in Fig. 3, has an internal cylindrical bore that is open at its proximal end (tube-side end), and also has an end wall capping the cylindrical bore's distal end. A guide wire 6 extends 8 out of a hole in the capping end wall (specification, p.15, parag.[0070]). In addition, the catheter has a flexible transport screw 13 that diametrally matches and contacts the interior of the working head's bore and which thus contacts the internal edges 15 of a lateral opening 14a (spec., p.15, parag.[0071]). The sharp edges (spec., p.8, parag.[0025], parag.[0027]) of this transport screw 13 rotate relative to, and in contact with, internal edges 15 of lateral opening 14a to shear and comminute occlusive material. Accordingly, as also depicted in Fig. 3, the distal end of transport screw 13 abuts on the capping end wall of the working head 11a and is configured for relative rotation against this end wall, in contact. Finally, again having reference to Fig. 3, the distal end of the flexible tube 12 has wall 18 reinforced 17 by an encased 18 helical spring 17 (spec., p.16, parag.[0072]), and this reinforced distal end is fixed to a recess in the working head's 11a open end (proximal end). Thus, this claimed

catheter enables the aspirating, fragmenting and removing of emboli and thrombi without employing externally rotating parts.

Independent claim 47 is similarly directed to a catheter enabling aspirating, fragmenting, and removing of emboli and thrombi associated with occlusive diseases of the blood vessels. As depicted in Fig. 1, a flexible tube 12 has a distal end connected to a working head 11. Depicted in greater detail in Figs. 2-3, 6, and 9-10, this working head 11 has its proximal end connected to tube 12 (spec., p.15, parag.[0070]). The working head 11a, as depicted in Fig. 3, has an internal cylindrical bore that is open at its proximal end (tube-side and), and also has an end wall capping the cylindrical bore's distal end. A guide wire 6 extends 8 out of a hole in the capping end wall (spec., p.15, parag.[0070]). In addition, the catheter has a flexible transport screw 13 that diametrally matches and contacts the interior of the working head's bore and which thus contacts the internal edges 15 of a lateral opening 14a (spec., p.15, parag.[0071]). The sharp edges of this transport screw 13 rotate relative to, and in contact with, internal edges 15 of lateral opening 14a to shear and comminute occlusive material. As further recited in claim 47, the helical transport surfaces of the screw 13 remove the occlusive material in a direction towards a proximal end (Fig. 1, near label 3) of the flexible tube 12. Accordingly, as also depicted in Fig. 3, the distal end of transport screw 13 abuts on the capping end wall of the working head 11a and is configured for relative rotation against this end wall, in contact. Finally, again having reference to Fig. 3, the distal end

of the flexible tube 12 has wall 18 reinforced 17 by an encased 18 helical spring 17 (spec., p.16, parag.[0072]), and this reinforced distal end is fixed to a recess in the working head's 11a open end (proximal end). Thus, claim 47 also recites a catheter that enables the aspirating, fragmenting and removing of emboli and thrombi without employing externally rotating parts.

Independent claim 48 is also directed to a catheter with recited elements enabling aspirating, fragmenting, and removing of emboli and thrombi associated with occlusive diseases of the blood vessels. As depicted in Fig. 1, a flexible tube 12 has a distal end connected to a working head 11. Depicted in greater detail in Figs. 3, 4-5, and 41-60, this working head 11 has its proximal end connected to tube 12. The working head 11, as depicted in Fig. 3, has an internal cylindrical bore that is open at its proximal end (tube-side end), and also has an end wall capping the cylindrical bore's distal end. A guide wire 6 extends 8 out of a hole in the capping end wall (spec., p.15, parag.[0070]). In addition, the catheter has a flexible transport screw 13 that diametrally matches and contacts the interior of the working head's bore and which thus contacts the internal edges 15 of a lateral opening 14b (spec., p.15, parag.[0071]). The sharp edges of this transport screw 13 rotate relative to and in contact with internal edges 15 of lateral opening 14b, 14i, 14k, 14l, 14m to shear and comminute occlusive material. Lateral opening 14b, 14i, 14k, 14l, 14m forms an L-shaped slot (Figs. 4-5, 41-60; spec., p.7, parag.[0022] line 9 thereof; p.10, parag.[0033]; p.16, parag.[0073]) having

longitudinally and circumferentially extending limbs. Accordingly, as also depicted in Fig. 3, the distal end of transport screw 13 abuts on the capping end wall of the working head 11 and is configured for relative rotation against this end wall, in contact. Finally, with reference to Fig. 3, the distal end of the flexible tube 12 has wall 18 reinforced 17 by an encased 18 helical spring 17, and this reinforced distal end is fixed to a recess in the working head's 11b, 11i, 11k, 11L, 11m open end (proximal end). Thus, claim 48 also delineates versions of catheters that enable the aspirating, fragmenting and removing of emboli and thrombi without employing externally rotating parts.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

There are three grounds of rejection to be reviewed on appeal:

1.) Claims 26-34, 36-45 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5873882 (Straub et al.) in view of U.S. Patent No. 4705511 (Kocak).

2.) Claims 35 and 48-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Straub et al. in view of Kocak, further in view of U.S. Patent No. 5312425 (Evans et al.).

3.) Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Straub et al. in view of Kocak, further in view of U.S. Patent No. 6565588 (Clement et al.).

7. ARGUMENT

1.) ***Rejection of claims 26-34, 36-45 and 47 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5873882 (Straub et al.) in view of U.S. Patent No. 4705511 (Kocak).***

A. Claims 26, 28-29, 31-34, 40-45, 47

With respect to the stated rejection, claim 26 stands or fall on its own, and claims 28-29, 31-34, 40-45, 47 stand or fall together with claim 26.

The Examiner has erred in holding that the combination of Straub et al. '882 and Kocak would have rendered the subject matter of claim 26 obvious to one of ordinary skill in the art at the time of the invention. This holding should be reversed because several of the Examiner's underlying findings of fact are erroneous and unsupported by substantial evidence.

In a first error necessitating reversal, the Final Rejection relies on an erroneous finding of fact that Straub et al. '882 discloses "working head having and end wall capping [the] cylindrical bore at [the] distal end of the working head," limitation found at lines 8-9 of appended appealed claim 26. In fact, the Straub et al. '882 working head (14, Figs. 6-7) identified by the Final Rejection merely has open-ended cylindrical form with an open end out of which a drive shaft (32) extends. This characteristic of Straub et al. '882 is also ascertainable from evidence appendix subsection 2 provided to the

Examiner. In Straub '882, the rotor (16, Figs. 6-7) partly overlies the working head stator (14) to form an external rotating component driven by shaft (32) fixed thereto (see column 4, lines 2-3 thereof). Cutting occurs between rotor (16) and working head stator (14) (see column 4, lines 22-23). Straub et al. '882 merely discloses a cylindrical working head stator (14) with open distal end (Fig.7, to the right of label pointer 16 terminus). Thus, the working head (14) of Straub et al. '882 has an open end without a distinct end wall capping a cylindrical bore.

The prior office actions have supported the Final Rejection against this first erroneous finding of fact by invoking definitions of the word "cap," and by asserting that the recitation of a distinct end wall capping the cylindrical bore of the working head recited in claim 26 does not distinguish the claim from working head stator (14) and rotor (16) of Straub et al. '882. Appellant respectfully submits to the Board that the word "cap" (see Final Rejection, page 3, lines 10-11) is a noun not found anywhere in the recitation of claim 26. Appellant also respectfully submits that the Examiner has erroneously invoked the respected principle of giving a claim its broadest reasonable construction, consistent with the specification as it would be interpreted by one of ordinary skill in the art, during examination (see, *In re Am. Acad. of Sci. Tech Ctr.,* 367 F.3d 1359, 1364; 70 USPQ2d 1827, 1830 (Fed. Cir. 2004); *In re Prater,* 415 F.2d 1393, 1404-05; 162 USPQ 541, 550-51 (CCPA 1969)), because the Final Rejection invokes this precedent in order to impermissibly overlook the recited, distinct structural

limitation of "said working head having an end wall capping said cylindrical bore" found in lines 8-9 of appended appealed claim 26. While the Board may concurrently observe (in Fig. 7, Straub et al. '882) the rotor (16) as overlying this open distal end of working head stator (14), the rotor (16) cannot possibly fulfill this claim limitation in light of the additional limitations recited at lines 17-19 of appended appealed claim 26. In summary, the Straub '882 cylindrical tube working head (14) bore does not have a bore-spanning end wall having the structural characteristics recited in appealed claim 26.

In a consequent second error necessitating reversal, the Final Rejection proceeds to an erroneous finding that Straub et al. '882 discloses "guide wire extending out of a hole in said end wall of said working head," limitation found at line 11 of the appended appealed claim. As explained immediately above, Straub et al. '882 merely discloses an open-ended bore for working head stator (14), lacking a distinct end wall capping it. Consequently, there is not any extant distinct "hole in said end wall" structure as required by the limitation recited in appealed claim 26.

In third error necessitating reversal, the Final Rejection relies on an erroneous finding that Straub et al. '882 discloses "flexible transport screw having a distal end configured to rotate relative to said end wall, wherein said distal end abuts said end wall," limitation found at lines 17-19 of the appended appealed claim. In fact, Straub et al. '882, at column 5, lines 1-5 thereof, explicitly teaches that distal front end (32a) of

shaft (32) extends into, thus fixedly connects (press-fits) to, head (16k) of rotor (16). This distal front end (32a) of shaft (32) exits to extend beyond the end of working head stator (14). Accordingly, the teachings of Straub et al. '882 explicitly refute the existence of a transport screw distal end abutting a distinct end wall of the working head to rotate relative thereto, as recited in claim 26.

In fourth error necessitating reversal, the Final Rejection relies on an erroneous finding that Straub et al. '882 discloses a helical transport screw where "said helix [has] an external diameter fitting the diameter of said cylindrical bore to rotate therein in contact therewith," with "said first lateral opening having internal edges in contact with said flexible transport screw distal part edges to shear and comminute material," and "said flexible transport screw distal part having sharp edges," limitations found across lines 21-27 of the appended appealed claim. More analytically, this difference may be understood by turning to Figures 2, 3, 6, and particularly 7 of Straub et al. '882, where the drive shaft (32) is disclosed as having a smaller diameter than the working head stator (14). Particularly in Figure 7 depicting the press-fitted joint between the distal part of shaft (32) and rotor head (16k), the smaller diameter of the helical drive shaft (32) shows fitted into the diameter of rotor head (16k) bore, it being smaller relative to working head (14) bore nearby. The Straub et al. '882 reference indicates, at column 4, lines 65-67 thereof, that these drawings convey information about differences in diameters. Thus, there is no clear basis of reasoning for supporting a conclusion that

helical shaft (32) of Straub et al. '882 has an external diameter fitting the diameter of the working head (14) cylindrical bore to rotate therein in contact therewith, nor for supporting a conclusion that a lateral opening in working head stator (14) has internal edges in contact with sharp edges of the helical shaft (32) to shear and comminute material. Instead, Straub et al. '882 explicitly teaches that cutting edges (16d) of the exterior rotor (16) and cutting edges (14d) of the interior working head stator perform the cutting (see column 4, lines 23-25; col. 4, lines 44-46). Helical drive shaft (32) merely serves as a conveyor screw (see column 5, lines 10-11). Accordingly, the findings of fact relative to Straub '882 concerning these claim limitations, as set forth in the Final Rejection, are erroneous.

The secondary reference, Kocak, has merely been relied upon to disclose a flexible tube with distal end portion including plastic-encased helical spring (Final Rejection, at page 4), and does not remedy any of the deficiencies of Straub et al. '882 enumerated in the preceding arguments of this Appeal Brief.

For the reasons stated above, reversal of the Final Rejection of independent claim 26 and of claims 28-29, 31-34, 40-45, 47, which stand together with claim 26, is respectfully solicited.

B. Claim 27

With respect to the stated rejection, claim 27 stands or falls on its own.

The Final Rejection relies on an erroneous finding of fact that Straub et al. '882 discloses "helix external diameter exactly fits said cylindrical bore's diameter to permit minimal diameter play." Figures 2, 3, 6, and particularly 7 of Straub et al. '882, disclose a drive shaft (32) having a smaller diameter than the working head stator (14). Particularly in Figure 7 depicting the press-fitted joint between the distal part of shaft (32) and external rotor head (16k), the smaller diameter of the helical drive shaft (32) shows fitted into the diameter of rotor head (16k) bore, it being smaller relative to working head (14) bore nearby. The Straub et al. '882 reference indicates, at column 4, lines 65-67 thereof, that the drawings convey information about differences in diameters. Accordingly, there is no clear basis of reasoning for supporting a conclusion that helical shaft (32) of Straub et al. '882 has an external diameter exactly fitting the cylindrical bore's diameter to permit minimal diameter play, as recited in claim 27.

C. Claim 30

With respect to the stated rejection, claim 30 stands or falls on its own.

The Final Rejection relies on an erroneous finding of fact that Straub et al. '882 discloses a working head lateral opening having external edges that are rounded. The Final Rejection asserts that support for this conclusion lies in Figures 2-3 of Straub et al. '882. However, these Figures do not clearly depict rounded external edges on the radially inner working head (14) stator's lateral opening. None of the remaining

Figures, 9-10, 6-7, 5 provide clear evidentiary support for a conclusion that Straub et al.'882 has a stator (14) working head with external rounded edges at its lateral opening. The written description thereof, at column 4, lines 22-25 fails to support such a conclusion. As stator working head (14) lies circumferentially within surrounding external rotor (16), and Figure 5 indicates sharp external edges for working head (14) there is no evidentiary basis for supporting reasoning leading to a conclusion that rounded external edges are either directly disclosed or suggested in Straub et al. '882.

D. Claims 36 and 38-39

With respect to the stated rejection, claim 36 stands or falls on its own, and claims 38-39 stand or fall with claim 36.

The Final Rejection relies on an erroneous finding of fact that Straub et al. '882 discloses a working head having external surface with a groove-like bottomed recess extending from a distal end region and opening into a lateral opening of the working head (14). Figure 7 of Straub et al. '882 discloses the stator working head (14) and depicts its external surfaces, some of which are surrounded by external rotor (16). There is no groove-like bottomed recess in these external surfaces, said recess to extend from distal end and to open into the lateral opening of the working head (14). The Final Rejection, at page 6 thereof, invokes the rotor (16) to seek support for finding of a bottomed recess as a "section between the outer portion of item 14's annular wall and

component 16's lateral opening" (quoting from page 6), irrespective of the teaching in column 3, lines 57-58 of Straub et al. '882 that rotor (16) rotates at between 30,000 to 40,000 rpm. Furthermore, this finding of fact ignores the advantages and problems addressed by the recited claim limitations, as explained, in part, at Appellant's specification paragraphs [0034] and [0073] (substitute specification dated August 30, 2006, at pages 10,16). This finding also ignores the recited limitation that the lateral opening has internal edges in with contact with the flexible transport screw edges, as a lateral opening in exterior rotor (16) would not contact the flexible transport screw.

To further highlight this erroneous finding of fact, the Board's attention is directed to Appellant's Figures 4-5, 26-35 of drawings in the present appealed application, all depicting examples of versions of the invention according to claim 36. There is insufficient evidentiary basis within Straub '882 to support reasoning that this reference would have yielded the invention as claimed in claim 36. Accordingly, reversal of the Final Rejection of claim 36 and of claims 38-39, which stand together with claim 36, is respectfully solicited.

E. Claim 37

With respect to the stated rejection, claim 37 stands or falls on its own.

Appellant respectfully contends that there is nothing in either Straub et al. '882 nor Kocak to provide reasoning sufficiently supporting a conclusion that a groove-like

bottomed recess having depth increasing in the direction from working head (14) distal end to proximal end would have been obvious. While the Final Rejection, at page 7, admits that Straub et al. '882 and Kocak fail to disclose this feature, the Rejection asserts that the claimed feature would have been obvious as a matter of design choice. This assertion ignores the unique advantages of the claimed arrangement of appealed claim 36 in facilitating advantageous handling of deposits in front of the working head, as referred to in Appellant's specification at paragraph [0035] (substitute specification dated August 30, 2006, at page 10). In contrast, Straub et al. '882, at column 4, lines 33-39 thereof, discloses entirely different structure for dealing with deposits in front of the rotor (16). Thus, the record fails to support the Final Rejection of claim 37 on the asserted grounds that it constitutes a design choice in the sense of precedent such as *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975), and reversal of this rejection is respectfully solicited.

2.) ***Rejection of claims 35 and 48-49 under 35 U.S.C. 103(a) as being unpatentable over Straub et al. in view of Kocak, further in view of U.S. Patent No. 5312425 (Evans et al.).***

A. Claims 48 and 35

With respect to the stated rejection, claim 48 stands or falls on its own, and claim 35 stands or falls with claim 48.

The preceding arguments presented on behalf of appealed claim 26 in subsection 7(1)A of this Appeal Brief are entirely applicable on behalf of appealed claim 48, as the erroneous findings of fact concerning Straub '882 there pointed out identically apply to claim 48.

The rejection of claim 48 further relies on U.S. Patent No. 5312425 (Evans et al.) as a basis for modifying Straub et al. '882 further to include a lateral opening in the form of an L-shaped slot with first longitudinal limb and a second limb circumferential, in working head (14). The stated reasoning to support the proposed modification is that such modification would provide a greater cutting surface area increasing the efficiency of the device allowing the device to remove more tissue at any given moment (see Final Rejection, at page 8).

Analysis of the disclosure of Evans et al. at Figure 5 (copied into the Final Rejection at page 8 thereof) reveals that at column 6, line 62 extending to column 7, line 7, Evans et al. provides the slots (102, 104) for the purpose of increasing flexibility of the housing (100). In contrast, the Straub et al. '882 reference comprises a working head (14) that is surrounded by a high-speed rotor (16). Cutting surface area in Straub et al. '882 is limited to the area of the lateral opening of this high-speed rotor (16). It is not possible to increase the flexibility of the Straub et al. '882 working head (14) by providing longitudinal limb segments and circumferential limb segments as in Evans et al., because the working head (14) is constrained within its surrounding rotor (16) which

rotates over it at high speed (column 3, lines 57-58) in operation. Furthermore, it is not possible to increase the cutting surface area of the Straub et al. '882 arrangement by providing longitudinal limb segments and circumferential limb segments in working head (14) as in Evans et al., because the lateral opening of the Straub et al. '882 external rotor (16) defines the cutting surface area (see column 4, lines 22-24, Straub et al.). Accordingly, the Final Rejection of claim 48 has relied on erroneous reasoning to reach the conclusion of obviousness and should be reversed.

B. Claim 49

With respect to the stated rejection, claim 49 stands or falls on its own.

The preceding arguments presented on behalf of appealed claim 48 in the immediately preceding subsection of this Appeal Brief are entirely applicable on behalf of claim 49. Claim 49 further recites a range of width ratios for the first and second limbs. Appellant's specification paragraph [0023] (see substitute specification dated August 30, 2006, at page 7) describes this range as particularly facilitating good material transport and clean shearing-off.

The addition of Evans et al. as fails to provide any additional basis for reasoning a further modification of Straub et al. '882 to include this claimed advantageous width range, because Straub et al. '882 effects material shearing by high speed rotor (16) cutting edges (16d) rotating around stator working head (14) cutting edges (14d). In

that arrangement, the lateral opening of the Straub et al. '882 external rotor (16) defines the cutting surface area and the exposed area of stator working head (14) lateral opening constantly changes. Accordingly, the Final Rejection of claim 49 has relied on erroneous reasoning to reach the conclusion of obviousness and should be reversed.

3.) ***Rejection of claim 46 under 35 U.S.C. 103(a) as being unpatentable over Straub et al. in view of Kocak, further in view of U.S. Patent No. 6565588 (Clement et al.).***

Claim 46 stands or falls together with claim 26.

8. CLAIMS APPENDIX

Claim 26. A catheter comprising:

a flexible tube, said flexible tube having a proximal end, said flexible tube having a distal end;

a working head, said working head having a proximal end, said working head having a distal end, said proximal end of said working head being connected to said distal end of said tube;

said working head having a cylindrical bore open from said proximal end of said working head, said working head having an end wall capping said cylindrical bore at said distal end of said working head;

a guide wire extending through said tube and through said cylindrical bore, and said guide wire extending out of a hole in said end wall of said working head;

a flexible transport screw extending from said proximal end of said tube through said tube to said distal end of said working head, said flexible transport screw provided with helically extending transport surfaces;

said flexible transport screw connected to a rotary drive configured to rotate said flexible transport screw;

said flexible transport screw having a proximal end, and said flexible transport screw having a distal end configured to rotate relative to said end wall, wherein said distal end abuts said end wall;

said flexible transport screw having a distal part disposed in said cylindrical bore, said flexible transport screw distal part forming a helix, said helix having an external diameter fitting the diameter of said cylindrical bore to rotate therein in contact therewith;

said flexible transport screw distal part having sharp edges;

a first lateral opening in said working head, said first lateral opening having internal edges in contact with said flexible transport screw distal part edges to shear and comminute material;

said flexible tube distal end having a proximate flexible tube distal end portion, said flexible tube distal end portion including a helical spring, said helical spring encased in a thin-walled plastic sheath; and,

said flexible tube distal end portion is connected to a recess in said working head proximal end.

Claim 27. The catheter as claimed in claim 26, wherein:

said helix external diameter exactly fits said cylindrical bore's diameter to permit only minimal diameter play.

Claim 28. A catheter as claimed in claim 26, further comprising:

said working head has an external surface, and said working head external surface tapers at said working head distal end.

Claim 29. The catheter as claimed in claim 26, wherein:

said first lateral opening internal edges are sharp.

Claim 30. A catheter as claimed in claim 26, further comprising:

said working head has an external surface;

said first lateral opening has external edges at said external surface; and,

said external edges are rounded.

Claim 31. The catheter as claimed in claim 26, wherein:

said lateral opening is a slot.

Claim 32. The catheter as claimed in claim 31, wherein:

said slot runs at least partially in an axial direction of said working head.

Claim 33. The catheter as claimed in claim 31, wherein:

said slot is formed at least partly along a helix relative to a longitudinal axis of said working head.

Claim 34. The catheter as claimed in claim 31, wherein:

said slot has width decreasing towards a proximal end of said working head.

Claim 35. The catheter as claimed in claim 31, wherein:

said slot is formed in an L-shape.

Claim 36. A catheter as claimed in claim 26, further comprising:

said working head has a distal end region proximate to said working head distal end;

said working head has an external surface;

a groove-like bottomed recess in said working head external surface, said groove-like recess extending from said working head distal end region to open into said lateral opening.

Claim 37. The catheter as claimed in claim 36, wherein:

depth of said groove-like bottomed recess increases in the direction from said working head distal end to said working head proximal end.

Claim 38. The catheter as claimed in claim 36, wherein:

a width of said groove-like bottomed recess is greater than a chord of an internal diameter of said working head.

Claim 39. The catheter as claimed in claim 36, wherein:

said slot is formed at least partly along a helix relative to a longitudinal axis of said working head.

Claim 40. The catheter as claimed in claim 26, wherein:

the connection between said flexible tube distal end portion and said recess in said working head proximal end resists tension and pressure.

Claim 41. A catheter as claimed in claim 26, further comprising:

at least one tube reinforcement in said flexible tube.

Claim 42. The catheter as claimed in claim 41, wherein:

said tube reinforcement is a metallic helix.

Claim 43. The catheter as claimed in claim 41, wherein:

said tube reinforcement is arranged on an inside of said tube.

Claim 44. The catheter as claimed in claim 26, wherein:

said working head is made of metal.

Claim 45. The catheter as claimed in claim 26, wherein:

said flexible transport screw is made of metal.

Claim 46. The catheter as claimed in claim 26, wherein:

said working head includes ceramic material.

Claim 47. A catheter comprising:

a flexible tube, said flexible tube having a proximal end, said flexible tube having a distal end;

a working head, said working head having a proximal end, said working head having a distal end, said proximal end of said working head being connected to said distal end of said tube;

said working head having a cylindrical bore open from said proximal end of said working head, said working head having an end wall capping said cylindrical bore at said distal end of said working head;

a guide wire extending through said tube and through said cylindrical bore, and said guide wire extending out of a hole in said end wall of said working head;

a flexible transport screw extending from said proximal end of said tube through said tube to said distal end of said working head, said flexible transport screw provided with helically extending transport surfaces;

said flexible transport screw connected to a rotary drive configured to rotate said flexible transport screw;

said flexible transport screw having a proximal end, and said flexible transport screw having a distal end configured to rotate relative to said end wall, wherein said distal end abuts said end wall;

said flexible transport screw having a distal part disposed in said cylindrical bore, said flexible transport screw distal part forming a helix, said helix having an external diameter fitting the diameter of said cylindrical bore to rotate therein in contact therewith;

said flexible transport screw distal part having sharp edges;

a first lateral opening in said working head, said first lateral opening having internal edges in contact with said flexible transport screw distal part edges to shear and comminute material, said helical transport surfaces removing material in a direction towards the proximal end of said tube;

said flexible tube distal end having a proximate flexible tube distal end portion, said flexible tube distal end portion including a helical spring, said helical spring encased in a thin-walled plastic sheath; and,

said flexible tube distal end portion is connected to a recess in said working head proximal end.

Claim 48. A catheter comprising:

a flexible tube, said flexible tube having a proximal end, said flexible tube having a distal end;

a working head, said working head having a proximal end, said working head having a distal end, said proximal end of said working head being connected to said distal end of said tube;

said working head having a cylindrical bore open from said proximal end of said working head, said working head having an end wall capping said cylindrical bore at said distal end of said working head;

a guide wire extending through said tube and through said cylindrical bore, and said guide wire extending out of a hole in said end wall of said working head;

a flexible transport screw extending from said proximal end of said tube through said tube to said distal end of said working head, said flexible transport screw provided with helically extending transport surfaces;

said flexible transport screw connected to a rotary drive configured to rotate said flexible transport screw;

said flexible transport screw having a proximal end, and said flexible transport screw having a distal end configured to rotate relative to said end wall, wherein said distal end abuts said end wall;

said flexible transport screw having a distal part disposed in said cylindrical bore, said flexible transport screw distal part forming a helix, said helix having an external diameter fitting the diameter of said cylindrical bore to rotate therein in contact therewith;

said flexible transport screw distal part having sharp edges;

a first lateral opening in said working head, said first lateral opening forming an L-shaped slot, said slot having a first limb extending substantially in a longitudinal direction and said slot having a second limb extending along a part of a circumference, said first lateral opening having internal edges in contact with said flexible transport screw distal part edges to shear and comminute material;

said flexible tube distal end having a proximate flexible tube distal end portion, said flexible tube distal end portion including a helical spring, said helical spring encased in a thin-walled plastic sheath; and,

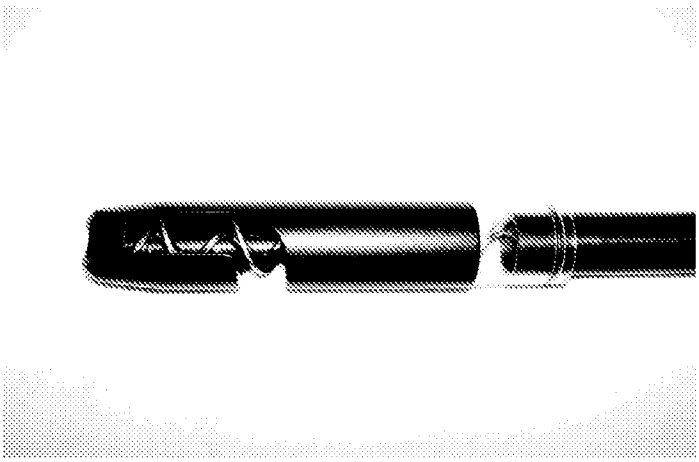
said flexible tube distal end portion is connected to a recess in said working head proximal end.

Claim 49. The catheter as claimed in claim 48, wherein:

a ratio of a width of the first limb extending in the longitudinal direction to a width of the second limb extending along a part of a circumference is from 1.0 to 1.3.

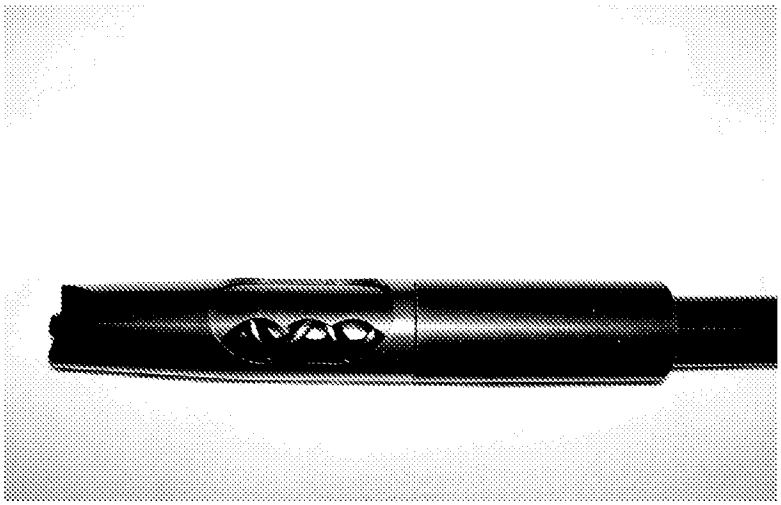
9. EVIDENCE APPENDIX

1. Evidence of large scale models according to versions of the invention claimed in independent claims 26 and 47 was presented to the Examiner in remarks filed June 25, 2006, entered by the Examiner in an Office Action dated July 8, 2010, and is reproduced below:

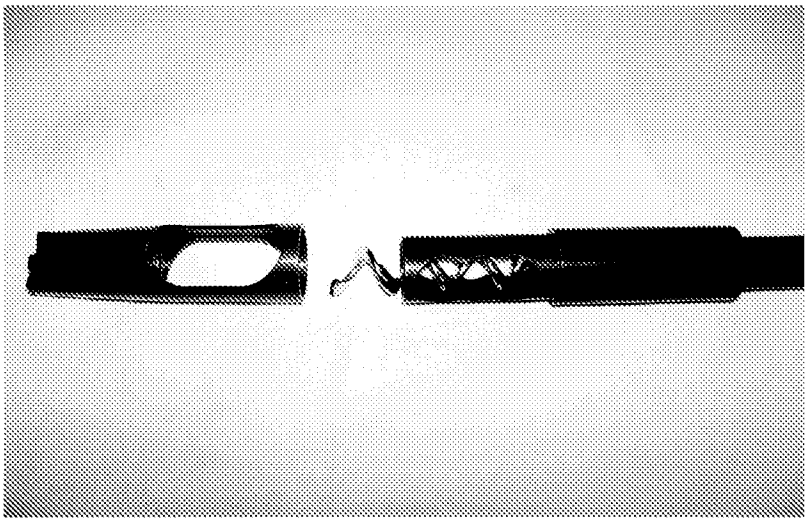


Originally labeled "C."

2. Evidence of large scale models according to the disclosure of U.S. Patent No. 5873882 (Straub et al., applied against the claims on appeal) was presented to the Examiner in remarks filed June 25, 2006, entered by the Examiner in an Office Action dated July 8, 2010, and is reproduced in following:



Originally labeled "A".



Originally labeled "B".

10. RELATED PROCEEDINGS APPENDIX

There are no other related proceedings.

Respectfully submitted,

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